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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/878,815	06/11/2001	Hassan S. Hashemi	00CON159PC-CIP1	3172

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EXAMINER
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OWENS, DOUGLAS W

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 03/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/878,815

Applicant(s)

HASHEMI ET AL.

Examiner

Douglas W Owens

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 02 December 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-27, 29 and 31-55 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-27, 29 and 31-55 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 2 and 5 - 14 are rejected under 35 U.S.C. 102(b) as being anticipated by US patent No. 5,703,405 to Zeber.

Regarding claim 1, Zeber teaches a structure (Fig. 7) comprising:

a substrate (705) having a top surface for receiving a die;

a printed circuit board (770) attached to the bottom of the substrate;

at least one via (750) in the substrate; and

the at least one via providing an electrical connection between a signal bond pad (735) of the die and the printed circuit board.

Regarding claim 2, Zeber teaches a structure, wherein the die is a semiconductor die.

Regarding claim 5, Zeber teaches a structure, wherein the substrate comprises a ceramic material (Col. 6, lines 28 – 32).

Regarding claim 6, Zeber teaches a structure, wherein the at least one via provides an electrical connection between a substrate bond pad (730) and the printed circuit board, wherein the substrate bond pad is electrically connected to the signal bond pad of the die.

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Regarding claim 7, Zeber teaches a structure, wherein the at least one via abuts the substrate bond pad.

Regarding claim 8, Zeber teaches a structure, wherein the substrate bond pad is electrically connected to the signal bond pad of the die by a signal bonding wire (See Fig. 7).

Regarding claim 9, Zeber teaches a structure, wherein the at least one via provides an electrical connection between a substrate bond pad (730) and a land, wherein said substrate bond pad is electrically connected to said signal bond pad of said die, and wherein said land (755) is electrically connected to said printed circuit board.

Regarding claim 10, Zeber teaches a structure, wherein the at least one via abuts the land.

Regarding claim 11, Zeber teaches a structure, wherein the at least one via provides an electrical connection between a substrate bond pad and a land (755), wherein the bond pad is electrically connected to the signal bond pad of the die, and wherein the land is electrically connected to the printed circuit board.

Regarding claim 12, Zeber teaches a structure, wherein at least one via abuts the substrate bond pad and the land.

Regarding claims 13 and 14, Zeber teaches a structure, wherein the substrate bond pad (730) is electrically connected to said signal bond pad of said die by a signal bonding wire.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 3, 4, 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zeber.

Regarding claims 3 and 4, Zeber does not teach a structure, wherein the substrate comprises an organic material selected from group consisting of polytetrafluorethylene and an FR4 based laminate. Organic substrates are old in the art and commonly used in the manufacture of semiconductor devices. It would have been obvious to one of ordinary skill in the art to select an organic material, or an organic material comprising polytetrafluorethylene or an FR4 based laminate, since they are known materials that are well suited for the intended use. The selection of a known material based on its suitability for its intended use supported a *prima facie* obviousness determination in *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945).

Regarding claims 15 and 16 Zeber does not teach a structure, wherein the via comprises copper or a thermally conductive material. The use of copper for conductive structures is old in the art. It would have been obvious to one of ordinary skill in the art to select copper for the conductive material in the via since copper is a known material

that is well suited for the intended use. Additionally, it is known that copper is a thermally conductive material.

5. Claims 17 – 27, 29, and 31 – 55 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zeber in view of US patent No. 5,942,795 to Hoang.

Regarding claims 17, 29, 44 and 51, Zeber teaches a structure (Fig. 7) comprising:

- a substrate (705) having a top surface;
- a die attached to the top surface of the substrate; and
- a plurality of vias (750) in the substrate.

Zeber does not teach a heat spreader attached to the bottom of the substrate and a first via providing a thermal connection between the die and the heat spreader. Hoang teaches a structure including a heat spreader (30) attached to the bottom of a substrate (24) and a first via providing a connection between the die and the heat spreader. It would have been obvious to one of ordinary skill in the art to incorporate the teaching of Hoang into the structure taught by Zeber, since it is desirable to remove excess heat from the die.

Regarding claims 18 and 45, Zeber teaches a structure, wherein the substrate is attached to a printed circuit board (770). Zeber does not teach a structure, wherein a heat spreader is attached to a printed circuit board. Hoang teaches a structure, wherein a heat spreader is attached to a bottom surface of the substrate. It would have been obvious to one of ordinary skill in the art to include the heat spreader taught by Hoang in the structure taught by Zeber for the reasons discussed above. If the proposed

modification had been made to the device taught by Zeber, the attached heat spreader would have also been attached to the printed circuit board.

Regarding claim 19, neither Zeber nor Hoang explicitly teach an electrically conductive heat spreader. It is common in the art to use metal (conductive material) for forming heat spreaders. It would have been obvious to one of ordinary skill in the art to select a heat spreader comprising a conductive material, such as a metal, since they are known materials that are well suited for the intended use.

Regarding claims 20 and 47, Zeber teaches a structure further comprising a down bond area (710) attached to the top surface of the substrate.

Regarding claims 21, 27, 48 and 50, Zeber does not teach a structure, wherein the first via provides an electrical connection between the substrate down bond area and the heat spreader. If the teaching of Hoang had been incorporated into the structure taught by Zeber, which would have been obvious for reasons discussed above, the first via would have provided an electrical connection between the substrate down bond area and the heat spreader.

Regarding claims 22 and 49, Zeber teaches a structure, wherein a semiconductor die ground bond pad (730) is electrically connected to the substrate down bond area by a down bonding wire.

Regarding claims 23 and 25, neither Zeber nor Hoang teach a structure, wherein the heat spreader is attached to a printed circuit board by solder. If the teaching of Hoang had been incorporated into the structure taught by Zeber, the heat spreader would have been attached to the printed circuit board by solder (760).

Regarding claim 24, Zeber does not teach a heat spreader, wherein the heat spreader is a thermal conductor. Hoang does not explicitly teach a heat spreader that is a thermal conductor. However, thermal conductivity is an inherent property of a heat spreader. It would have been obvious to include the teaching of Hoang into the structure taught by Zeber for reasons discussed above.

Regarding claim 26, Zeber teaches a structure, wherein a second via in the substrate provides a connection between a signal bond pad of the semiconductor die and a printed circuit board.

Regarding claims 31 and 32, Zeber does not teach a structure, wherein the substrate comprises an organic material selected from group consisting of polytetrafluorethylene and an FR4 based laminate. It would have been obvious to one of ordinary skill in the art to select an organic material, or an organic material comprising polytetrafluorethylene or an FR4 based laminate, since they are known materials that are well suited for the intended use, as discussed above. Additionally, Hoang teaches a substrate comprising FR4. It would have been obvious to incorporate the teaching of Hoang into the teaching of Zeber for reasons discussed above.

Regarding claim 33, Zeber teaches a structure, wherein the substrate comprises a ceramic material.

Regarding claims 34 and 52, Zeber teaches a structure, wherein the second vias provide an electrical connection between a substrate bond pads and said printed circuit board, wherein said substrate bond pads are electrically connected to said signal bond pads of the semiconductor die.



Regarding claim 35, Zeber teaches a structure, wherein the second via abuts the substrate bond pad.

Regarding claim 36, Zeber teaches a structure, wherein the substrate bond pad is electrically connected to the signal bond pad of the semiconductor die by a signal bonding wire.

Regarding claims 37 and 53, Zeber teaches a structure, wherein the second vias provide an electrical connection between the signal bond pads of the die and the lands (755), and wherein the lands are electrically connected to the printed circuit board.

Regarding claim 38, Zeber teaches a structure, wherein the second via abuts the land.

Regarding claim 39, Zeber teaches a structure, wherein the second via provides an electrical connection between a substrate bond pad and a land (755), wherein the bond pad is electrically connected to the signal bond pad of the die, and wherein the land is electrically connected to the printed circuit board.

Regarding claim 40, Zeber teaches a structure, wherein the second via abuts the substrate bond pad and the land.

Regarding claim 41, Zeber teaches a structure, wherein the substrate bond pad is electrically connected to the signal bond pad of the die by a signal bonding wire (See Fig. 7).

Regarding claims 42, 54 and 55, Zeber does not teach a structure, wherein the vias comprise copper. It would have been obvious to one of ordinary skill in the art to

select copper for the conductive material in the via since copper is a known material that is well suited for the intended use.

Regarding claim 46, Zeber teaches a structure, wherein a second plurality of vias in the substrate provide connections between a plurality of signal bond pads of said semiconductor die and said printed circuit board.

***Response to Arguments***

6. Applicant's arguments with respect to claims 1 – 27, 29 and 31 - 55 have been considered but are moot in view of the new ground(s) of rejection.


***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Douglas W Owens whose telephone number is 703-308-6167. The examiner can normally be reached on Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on 703-308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

DWO  
March 11, 2003

  
TOM THOMAS  
SUPERVISORY PATENT EXAMINER  
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